

*The epidemiology of the septic tank is described with suggestions for helping builders of mass housing to prevent future disease outbreaks and nuisances.*

## Sewage Disposal in Mass Building

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IN the past 10 years, the urban fringe has seen the installation of millions of septic tanks, far more than had been eliminated by sanitary engineering services in the previous 50 years.

The septic tank has been installed not only for those who have land and income generous enough to accommodate and maintain the facility, but for families who have neither the space nor the resources to prevent the development of a sanitary nuisance and a public health hazard. Often such families must go to the expense of a new installation or, if possible, thorough reconstruction. Septic tanks may work well in rural areas if people do not live too close to each other or use a great deal of water for bathing, laundry, air conditioning, and dishwashing.

To put it simply, a septic tank is a country cousin that came to town and promptly got into trouble. In its place—a rural setting—the septic tank and subsurface drain field is a suitable method of domestic sewage disposal, given adequate drainage, soil conditions, and water table; but it was never intended for use in settlements with more than one family dwelling per acre. Even this may be too dense for septic tanks if soil conditions and water tables are not ideal.

Where public facilities cannot be arranged,

the septic tank soil absorption system of sewage disposal, originally designed for rural areas, is now widely utilized as a convenient and temporary substitute. Under rural conditions and with proper design, construction, and maintenance, this system will usually give some degree of satisfactory performance.

If failure of the soil absorption system occurs under rural conditions, the danger to public health is minimum since there are plentiful opportunities to choose another location for a new system. In urban areas, the septic tank is often a needless and frequently an extravagant method of sewage disposal which threatens to be a sanitary nuisance and a public health hazard to millions of homeowners.

Then, why have there been so many septic tanks installed during the past 10 years?

The following discussion will attempt to explain why builders adopt these expedient but short-sighted construction methods and to suggest what may be done about it.

The epidemiology of the septic tank itself suggests therapeutic and preventive measures for this form of community sickness, a sickness that is appraised not only by the number of individual infections but by nuisance, expense, and disorder. It is the business of public health to treat the community as the physician treats the person. And in view of the prospect of the continuing building boom, it is the business of public health to assure that this community sickness will not prevent or stunt healthy community growth.

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## Builders Are Human

In my judgment, the postwar building program is yet to reach its peak in many areas of the country. The housing deficit, accumulated since 1926, has been overcome only in isolated communities and for isolated income groups. Much of the housing built since 1940 has been only a temporary palliative to housing needs. Millions of units, fundamentally well-built and well-equipped, are already too small for growing families. With rising incomes, families are demanding more of housing. If you add to these factors the steady obsolescence of aging buildings, spatial shifts of population, and the rising birth rate, it is apparent that the current production rate of 1.3 million dwelling units a year is not excessive.

Accurate figures are not available, but in my opinion the estimate that at least 24 million persons in the United States are served by 6 million individual septic tank systems is close to the truth. More important, however, is the estimate that more than one-third of the new homes now being constructed will have septic tank systems for sewage disposal. All of this continues against the better judgment of many in the public health profession, and presents one of the greatest challenges sanitary engineers and other public health workers will have to face in the years to come. Must we abet septic tanks?

The mass building industry is chronically in need of land, low-priced land, in large tracts. Such land is seldom to be found within city limits, where zoning laws and city plans apply, and where community water and sewerage facilities are likely to be present or required.

Mass builders usually find the land they need in territory where inhabitants or governing authorities have had meager or limited experience in urban development. It is unlikely that in such an area there is any local person equipped to supervise the builders and their sewage disposal plans. The burden of supervision usually falls on the county and State officials and, in some instances, on the insuring and lending agencies. Even so, in the interest of profit and sound construction, progressive mass builders would prefer to put in community water and



**Serving several subdivisions, this activated sludge plant houses two primary mechanical aerator units, a sludge digester, laboratory, pump room, office, and truck loading room for digested sludge. The slump brick terrace (lower terrace) is a chlorine contact chamber and the higher terrace (second floor level) is a secondary clarifier.**

sewerage facilities. What stands between them and their better judgment is a matter of money.

Typically, a builder does not construct 200 houses wholesale and then sell them in one lot. In phase building, he finishes one house at a time. And he sells one at a time, as the units are finished. Even if his sales are committed in advance, settlement of the title is closed only as the individual houses are finished.

Naturally, he wishes to recover water and sewerage installation costs on each house as it is sold. Such recovery is easiest when the house has a private well and septic tank.

It is not as easy to recapture the investment in community facilities with any rapidity. To provide community sewerage facilities for no more than 500 units would tie up between \$150,000 and \$200,000 while the houses are in construction. It may take a little time before this investment can be freed. There have been few, if any, financial institutions willing to carry that kind of investment, especially for builders who may sell no more than 50 to 100 houses a year. Such financing is certainly not practical for the typical builder who needs a fast turnover on limited capital simply to keep himself going. Even mass builders are susceptible to the appeal of the fast return of their

money. Some have ventured to use septic tanks with projects of as many as 8,000 homes and larger.

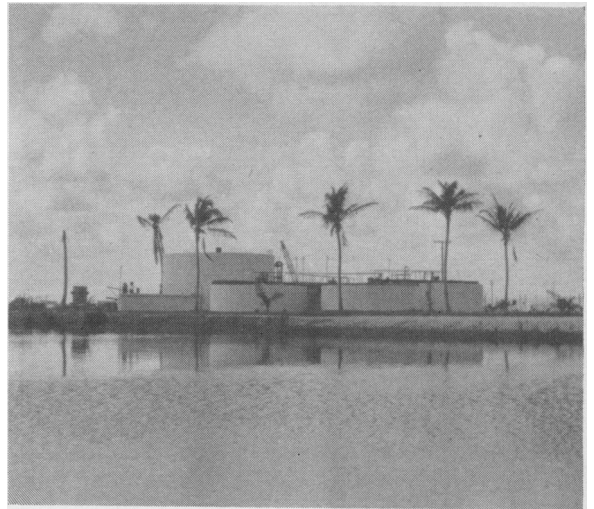
### **The Cost of Services**

Given financing, it would be to the great advantage of both the builder and the community to install community water and sewerage facilities. To deal with sewage disposal alone, the Florida builder can install sewers at a charge ranging from \$150 to \$250 per lot. To include the cost of sewage treatment facilities for 500 families in my own State would run the total charge for sewage disposal facilities to from \$300 to \$400 a dwelling.

The superior attraction of a house with sewerage connections will enhance the market value of the structure by some amount over and above the ordinary charge for septic tank installations. Although the increased value of the house may return a price that will pay for the community sewage collection and treatment facilities, title to the plant would remain with the builder. Furthermore, by collecting sewage service charges, he may cover operating, maintenance, and amortization costs, and so recover his investment. Meanwhile, the community would have the advantage of a trouble-free waste disposal system. The gross income from 500 houses with community water supply and



**Aeration tank and public water supply tank in the background with the sludge digester and control house in the foreground serving Carol City, Fla., near Miami.**



**Carol City activated sludge plant as seen from across the manmade lake into which the effluent discharges.**

community sewerage may amount to approximately \$30,000 a year. Such an operation is practical with as few as 200 houses.

Recognizing such financial advantages, 120 subdivisions in Florida have installed their own community sewage disposal facilities and community water systems in the past 5 years. But several were motivated also by a stern refusal by government officials to permit septic tank construction in areas where such disposal methods are no longer suitable.

It can often be demonstrated that the average cost of a septic tank and subsurface disposal system and the cost of maintaining and operating such a system are certainly equal to, and, in many cases, more expensive than a monthly sewer service charge for a method of sewage disposal that is not only safe but trouble free.

### **Corrective Measures**

Once septic tanks are in, especially in areas with a high water table, poor soil conditions, and relatively dense settlement, the corrective measures frequently require that they be bypassed. They may serve well during dry periods but let the rains come and in no time the soil is saturated: From the ground surface noxious gases will come forth; septic tank effluents will appear on the ground; they may

back up into bath tubs or prevent the flushing of commodes.

As this was written, on January 24, 1956, two ladies called me to report that more than 100 septic tanks in their subdivision had failed in the past 24 hours. The gases coming back through the plumbing and into the house were so serious that the house had to be opened and the attic fan used to freshen the air. This was besides the fact that the yard was flooded with septic tank effluent.

In one subdivision with 180 homes of a high financial bracket, soil conditions were such during 1955 that 25 homeowners were obliged to construct relief sewers from their drain field to the roadside ditch in order to allow the wastes to escape.

Since sewerage is the only practical correction for defective septic tank installation, it seems obvious that in mass building projects sewers should be installed when the homes are built.

We, in Florida, recommend that plumbing in all new houses be so constructed and septic tanks, when used, be so located—on the side of the house or in the front—as to facilitate eventual connection to a sanitary sewer.

### **Preventive Measures**

What can be done to assure that mass housing projects of the future will be built with adequate community sewerage facilities?

Of all possible means of preventing undesirable septic tank construction in the future, aggressive, direct efforts by government officials, by builders, and by insuring and financing agencies are most likely to produce results. Governments and political subdivisions can strive to overcome artificial political barriers which today strangle rational urban growth, and which, in fact, encourage undesirable building in outlying areas at the expense of well-established urban centers. Whether it is done by creating sanitary districts, metropolitan or regional planning authorities, county and State zoning officials, new boundaries, or local government holding companies, the accommodation of urban growth is a primary political responsibility of local and State governments.

If local and State governments impart such

political muscle to zoning and planning commissions, it cannot be too heavily stressed that members of such commissions should be independent of financial pressure and political and special interests. Commissions should be staffed by qualified and intelligent laymen as well as professional personnel with merit system status. They should also be sensitive to the welfare of the people and be interested only in the development of the area they serve and the part it plays in the development of the State and the Nation.

The most immediate opportunity for good work in urban growth, however, is in the hands of agencies which insure, guarantee, or underwrite funds for residential construction and development. It would be to their own interest and protection to assure loans for community water and sewerage facilities and to require such systems for all dwellers whose financing they insure in mass building developments. If these agencies would do no more than agree to insure mortgages on community facilities, builders, the financial people, sanitary engineers, and others will certainly work out the details. In my opinion, the greatest need in housing today is for leadership in the financing of community water and sewerage facilities.

### **Summing Up**

Based on my experience, it has been demonstrated that the septic tank in congested neighborhoods is uneconomic, unwise, and unwholesome. Its widespread use in recent years may be due largely to the failure of local government officials to assure wise and orderly development of new neighborhoods and to the failure of financial institutions to encourage builders to install community sewerage facilities. Since sewerage facilities are the only practical alternative to the use of septic tanks, their construction must be encouraged if we are to avert the installation of millions of septic tanks in the next 10 years. All government agencies need to organize better methods of managing urban and suburban growth. But immediate benefits will result from agreements by insuring and lending agencies to finance community facilities for water supply and sewage collection and treatment.